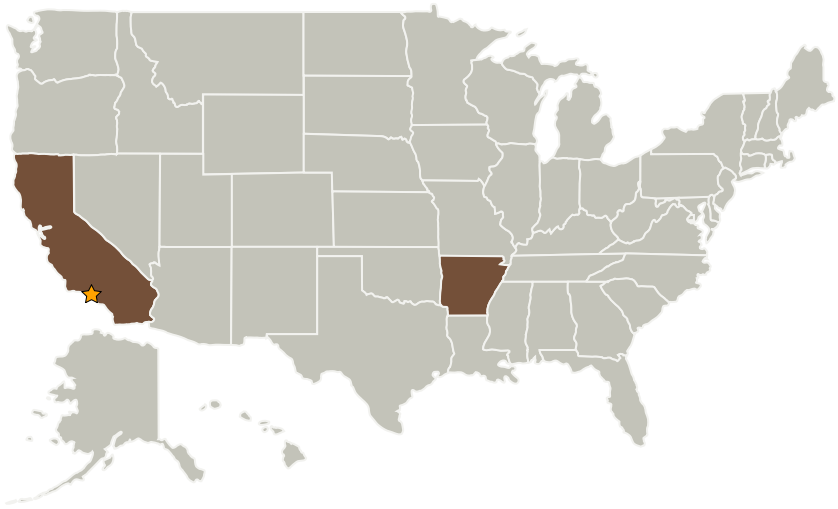
High Temperature All Silicon-Carbide (SiC) DC Motor Drives for Venus Exploration Vehicles, Phase I

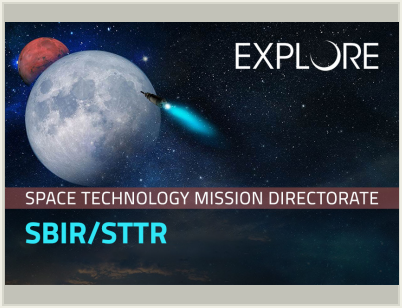
Completed Technology Project (2006 - 2006)

Project Introduction

This Small Business Innovation Research Phase I project seeks to prove the feasibility of creating high-temperature silicon-carbide (SiC) based motor drives for extreme environment exploratory robotic missions (such as Venus landers). SiC digital control ICs will be developed for controlling power electronics systems (such as motor drives) and integrated with SiC power switches into a multichip power module (MCPM) capable of reliably operating within extreme environments such as the surface of Venus without shielding. Avoiding complicated advanced active thermal management strategies not only improves reliability, but significantly reduces the complexity, weight, and volume of the overall electronics systems. SiC power electronics offer other potential advantages over silicon as well, including 1/10th the switching losses, 10? the power density, 10? the breakdown voltage, and switching frequencies into the 10s of GHz range. All of these advantages offer the potential to develop highly miniaturized, highly reliable, low weight extreme environment power electronics drive systems that can be integrated directly with DC motors or actuators.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Arkansas Power Electronics International, Inc.	Supporting Organization	Industry	Fayetteville, Arkansas

Primary U.S. Work Locations	
Arkansas	California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors